"DETERMINATION OF RAINFALL/RUNOFF MODEL PARAMETERS"

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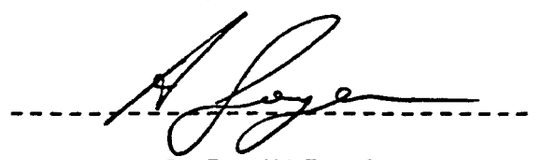
CERTIFICATION STATEMENT

I hereby declare that the content of this thesis does not comprise any work or material which I have previously submitted for a Degree or other similar award from any other Institute of Technology or University.



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ABSTRACT

"DETERMINATION OF RAINFALL/RUNOFF MODEL PARAMETERS"

KEY WORDS: Stochastic-Deterministic, Rainfall/Runoff Models. Joint Probability, Antecedence, Parameters-Field Measurements.

ABSTRACT: Runoff estimates both peaks and volumes are called for in design analysis for the sizing of a wide range of engineering structures. In many instances runoff records are very short or not available and it is necessary to use synthetic rainfall data and apply a rainfall/runoff model to estimate appropriate design hydrographs. This thesis addresses the particular portion of the rainfall/runoff process conversion dealing with the development of excess hyetographs prior to catchment routing and the estimation of the parameters affecting such development. Details are given on field based parameter estimating procedures as well as further model development to better reflect measurable input parameters. A joint probability model linking moisture deficiency criteria prior to an event, rainfall data and measured catchment parameters is developed and applied on Canberra data.

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LIST OF SYMBOLS

A	Subcatchment area in km^2.
A	Transition Probabilities Matrix.
A	Infiltration parameter (cm/min^1).
Ac	Cross-Sectional area of core (cm^2).
AO,A1	Redistribution Parameters.
API5	Five day antecedent prec. index.
B	Subarea coefficient.
B	Infiltration parameter ($cm/min^{3/2}$).
b_{jik}	Conditional probability of Qo_j given R_i. and M_k.
CAPIMP	Impervious store capacity.(mm).
CWI	Catchment Wetness Index.
C	Rational Method Runoff Coefficient.
DS	Pervious Depression storage.(mm).
DSC	Depression store capacity.(mm).
D	Diameter of soil core.(mm).
D(wet)	Wet density.(g/mm^3) and (g/cm^3).
D(dry)	Dry density.(g/mm^3) and (g/cm^3).
ER	Proportion of transpiration from US.
ECOR	Ratio of Pot. Evap. to A class pan.
f	Dimension of vector Qo.
FIMP	Proportion of catchment that is impervious.
GN	Variable rate groundwater recession factor.
GS	Groundwater storage.(mm).
H	Hydraulic head - dist. from base of core to pondage surface.(cm).
i	Cumulative infiltration.(cm).
ISC	Interception store capacity.(mm).
IAR	Proportion of rainfall intercepted by vegetation.
IDS	Impervious depression storage.(mm).
IS	Interception storage.(mm).
I	Rainfall intensity in mm/hr for a return period fy and duration Ta.
I	Infiltration rate.(mm/hr).
KG	Constant rate groundwater recession factor.
K	Subarea storage delay time in hours.
Ko	Saturated hydraulic conductivity.(cm/min).
L	Length of soil core.(cm).
LSC	Lower soil store capacity.(mm).
LH	Maxrate of water uptake from roots from lower soil store.(mm/day),
LDF	Lower soil drainage factor.
LS	Lower soil storage.(mm).
l	Dimension of vector R.
M_k	Particular value of parameter.
m_k	Probability of M_k.

m	Parameter value.
P(Q)	Peak flow prob. of exceedence.
$p(Q,T_i,R_j,I_k)$	Conditional probability of Q being exceeded given that T_i,r_j and I_k occur.
$p(T_i)$	Probability of T_i occuring.
$p(V_j)$	Probability of V_j occuring.
$p(I_k^j)$	Probability of I_k^j occuring.
Q	Instantaneous rate of runoff in m^3/s.
Qw	Volume of water discharged in time t.(cm^3).
Qo	Vector representing probability distribution of output.
qo_j	Probability of Qo_j.
Qo_j^j	Particular value of output.
qo^j	Output variable.
Q(fy)	Peak runoff for return period fy years.(m^3/s).
R	Vector representing probability distribution of input.
r_i	probability of R_i.
r^i	input variable.
R_i	Particular value of input.
S^i	Main channel slope in %.
S	Sorptivity ($cm/min^{1/2}$).
SO	Sorptivity at zero moisture level.
SMD	Soil moisture deficiency.
t	Time (min).
T	Time of concentration.
Ta	Rainfall intensity averaging time.
(1+U)	Urbanisation factor - equals fraction urbanised.
US	Initial moisture content in upper soil store (mm).
UH	Maxrate of water uptake from roots from upper soil store.
USC	Upper soil store capacity.(mm).
Vt	Total volume of soil sample.(mm^3).
V	Basin storage constant for an assumed linear reservoir.
Ww	Weight of water in soil sample (g).
Ws	Weight of dry soil in soil sample (g).
Wt	Total weight of soil sample (g).
W(Vol)	Moisture content by volume. (%).
W(Wt)	Moisture content by weight. (%).
X), Y).	values related to time in infiltration equ.